

$$\sqrt{\overline{oa}} = oc = \sqrt{\frac{x_1^2 + x_2^2 + \dots x_n^2}{n}} = \text{root-mean-square.}$$

The root-mean-square is evidently the abscissa of the point of intersection of the line,  $y = mx$ , with the hyperbola,  $xy = 1$ , for we have

$$y = mx = \frac{n}{x_1^2 + x_2^2 + \dots x_n^2} x = \frac{1}{x}$$

$$\therefore x = oc = \sqrt{\frac{x_1^2 + x_2^2 + \dots x_n^2}{n}}$$

If we overlook the physical requirements and base our definition on the mathematical relations only, it is evident that the definitions of harmonic mean and reciprocal harmonic mean are inconsistent—the definitions should be interchanged as each of the other means is a function of  $1/m$  instead of  $m$ .

It is interesting to note that with the exception of the root-mean-square which is defined with reference to the simplest form of hyperbola, all of the means here discussed are defined with reference to the straight line,  $y = a + bx$ , in which  $a = 1$  and  $b = 0$ .

Generalizing our results, we may say that certain means may be defined as the abscissa, or as a function of the abscissa of the point of intersection of the line,  $y = mx$ , with the curve,  $y = f(x)$ . The value of  $m$  is determined by the method of least squares from the  $n$  points ( $x_1, y_1$  weight  $p_1 \dots x_n, y_n$  weight  $p_n$ ) on the curve  $y = f(x)$ , the abscissae ( $x_1, x_2 \dots x_n$ ) of the  $n$  points being the quantities whose mean is to be determined. A further generalization of the definition consists in replacing the  $x$  coordinates by functions of these coordinates such as  $\log x$ .

PALEONTOLOGY.—*New species of mollusks from the Eocene of Texas.*<sup>1</sup> JULIA GARDNER, U. S. Geological Survey.

This paper contains descriptions and figures of 21 new species and subspecies of mollusks from the Claiborne and Wilcox groups in Texas, distributed as follows: Cook Mountain formation, 16; Lisbon formation, 1; Yegua formation, 1; Wilcox group, 3.

<sup>1</sup> Published by permission of the Director, U. S. Geological Survey. Received May 12, 1927.

Family LEDIDAE  
Genus LEDA Schumacher  
**Leda trivitate** Gardner, n. sp.

Figure 5

1919. *Leda houstonia* Harris, Bull. Am. Pal. 6: pl. 23, f. 13. Not *Leda houstonia* Harris, 1895.

Shell small, thin, rather highly polished, compact; the altitude of the shell exceeding half the latitude, broadly and quite strongly inflated. Umbonal angle very large. Umbones not conspicuous; slightly bulbous and feebly opisthogyrate, placed a little in front of the median vertical. Anterior dorsal margin more gently sloping than the posterior; anterior extremity broadly rounded; posterior extremity obtusely rostrate; base line strongly arcuate; posterior ridge obtuse and, toward the ventral margin, often ill-defined; posterior area thus delimited, narrow, lanceolate with faint traces of secondary rays, both posterior and anterior sometimes visible. External surface for the most part smooth; a microscopically fine, concentric striation usually developed toward the lateral and ventral margins; traces of radial threadlets often visible upon the ventral portion of the rostrum and, more rarely, upon the anterior ventral margin. Ligament pit minute, subumbonal, wider than it is high. Teeth strong, elevated medially, lower toward the distal extremities of each series; anterior teeth not far from ten in number, coarser than the posterior teeth which run close to fifteen. Adductor impressions relatively large; the anterior sub-circular, the posterior larger and more angular. Pallial line obscure. Inner margins entire excepting for a very fine crenulation along the rostrum.

Dimensions: Altitude, 2.5 millimeters; latitude, 4.0 millimeters; diameter, 2.1 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369248.

*Type locality*.—Bluff on San Antonio River 4 miles south-southeast of Floresville, Wilson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

*Leda trivitate* is closely allied to *Leda houstonia* Harris. It is, however, a smaller, relatively higher and more inflated species, with a less sharply defined sculpture both radial and concentric.

It is more widely distributed than *L. houstonia* and more abundant at the localities at which it occurs.

**Leda jewetti** Gardner, n. sp.

Figure 6

Shell small, plump, polished, the young not far from equilateral; the adults produced slightly and obtusely rostrate posteriorly. Anterior dorsal margin a little higher than the posterior; anterior lateral margin broad and broadly rounded; posterior extremity narrow, obtuse; base line strongly arcuate, constricted in front of the rostrum in the adults. Umbones full, the tips proximate and opisthogyrate, slightly anterior. Lunule and escutcheon similar, the former a little less produced, narrow, lanceolate, delimited by a

ridge most elevated near the umbones. Posterior area defined by a secondary ray evanescing upon the rostrum. External surface concentrically threaded medially, the threads uniform over a symmetrical area, the sculpture abruptly disappearing a little in front of the rostrum and more gradually evanescing anteriorly. Ligament minute, sub-umbonal. Dentition vigorous, the teeth elevated and acutely  $\Lambda$ -shaped medially, those of the anterior series more crowded and more numerous than of the posterior. Adductor scars obscure, relatively large and well up under the dorsal margins. Pallial line obscure. Inner margins entire.

Dimensions: Altitude, 3.8 millimeters; latitude, 6.2 millimeters; semi-diameter, 1.7 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369243.

*Type locality*.—8 miles south of Jewett, Leon County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

*Leda jewetti* is doubtless the Texas analogue of the Mississippi species *Leda catasarca* Dall. The outlines and dimensions of the two forms are similar but the posterior area of *L. catasarca* is more sharply defined; the concentric ribbing is broader and less uniform, usually less elevated and developed over a more restricted area. In *L. jewetti* the entire medial portion of the shell is threaded from the umbones to the base line, the triangular sculptured area extending from an approximately equal distance in front of and behind the umbone. In *L. catasarca*, on the contrary, the sculpture is comparatively feeble over the entire anterior half of the shell, though it is continued posteriorly to a greater degree than in *L. jewetti*.

#### *Leda atakta* Gardner, n. sp.

Figures 7, 8

Shell rather small, plump, constricted and rostrate posteriorly. Umbones sub-central, quite full; the tips proximate and opisthogyrate. Anterior dorsal margin obliquely descending; posterior dorsal margin slightly produced and feebly concave; base line arcuate, ascending posteriorly. Lunular area depressed but not well defined. Escutcheon produced for about half the distance from the umbones to the posterior ventral margin, feebly depressed; the margin elevated and clearly defined by an elongate-cordate area inclosing the escutcheon and extending from the umbones to the extremity of the rostral ray; a second ray developed anterior to the rostrum, well defined but not conspicuous; its extremity indicated at the ventral margin by a slight jog. Concentric sculpture not developed upon the umbonal area; surface away from the umbones threaded with well rounded lirae evanescent upon the anterior portion of the shell and abruptly disappearing a little in front of the secondary rostral ray; rostrum incrementally striated but not threaded. Chondrophore minute, sub-umbonal. Dentition moderately strong; the teeth in the anterior series approximately 18 in number; posterior series feebly concave, of nearly the same length as the anterior but less crowded, containing only about 15 component teeth. Adductor and pallial scars very obscure; shell reinforced by a slight thickening upon the inner surface directly in front of the rostrum.

Dimensions: Altitude, 3.5 millimeters; latitude, 6.0 millimeters; diameter, 2.6 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369241.

*Type locality*.—Smithville, Bastrop County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

*Leda atakta* is a species of no striking characters but it does not conform to any of the prescribed groups. *Leda jewetti* is relatively higher, with rostral rays and with a concentric sculpture developed over a greater part of the surface. *Leda media* to which *L. atakta* is closely related is more produced and attenuated posteriorly, with a finer concentric sculpture developed upon the umbones, as well as upon the medial and ventral portions of the shell. In both species, however, the sculpture is obsolete upon the anterior portion of the shell.

Family ARCIDAE  
Genus BARBATIA Gray

***Barbatia deusseni* Gardner n. sp.**

Figures 20, 21

1919. *Arca rhomboidella* Harris (part), Bull. Am. Pal. 6: 51. Not *Arca rhomboidella* H. C. Lea, 1833.

Shell rather small, moderately heavy, transversely elongated, obliquely constricted mesially; basal margin parallel to the hinge; anterior lateral margin obliquely truncated; the posterior lateral margin vertically truncate, rounding into the base but angulated at the hinge. Umbones prominent, inflated, overtopping the hinge line; the tips flattened, incurved, prosogyrate, and falling within the anterior third. External surface closely sculptured radially, the ribs 40 in number on the type, finest and closest upon the obscure medial depression; slightly coarser and tuberculated anteriorly; coarsest and least crowded upon the obtuse posterior keel; anterior and medial ribs medially sulcate; posterior ribs entire though somewhat nodulated; a very fine, even, concentric threading visible in the interspaces and reflected in the nodulation of the ribs. Cardinal area very narrow, asymmetric; area beneath and in front of the umbone smooth; area behind the umbones obliquely grooved. Hinge very narrow medially, widening laterally; teeth beneath the umbones very short and vertical; short and oblique along the narrow posterior portion of the hinge, the distal teeth quite coarse and approximately parallel to the hinge. Muscle scars and pallial line obscure. Inner margins coarsely dentate.

Dimensions: Altitude, 11.6 millimeters; latitude, 17.7 millimeters; semi-diameter, 5.2 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369244.

*Type locality*.—One mile below Collins Ferry, Burleson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

Lea's Claiborne species, with which the Texas form has been confused, is decidedly less gibbous, more elongated transversely, and with a less uniform ribbing.

I have the pleasure of naming this form in honor of Alexander Deussen, Esq., who by his assiduous collecting has so largely increased our knowledge of the Tertiary of Texas.

Family OSTREIDAE

Genus OSTREA Linnaeus

*Ostrea duvali* Gardner, n. sp.

Figures 1-4

Shell of moderate dimensions for the genus, inequivalve, ovate-trigonal in outline, frequently with a large attachment area and relatively broad in consequence. Surface layer decorticated; right valve built up of overlapping concentric lamellae so that the shell thins toward the ventral margin, and would be heaviest in the umbonal area were it not for the encroachment of the ligament area; a subcutaneous radial threading on the right valve but no true radial sculpture developed; left valve fluted with narrow radials ranging in number from 20 to 25 in the narrower forms and running to 35 and 40 in the broader; obsolete on the attached surface. Ligament area large, flattened in the right valve; the medial depression in the left valve broadly U-shaped. Lateral margins of right valve finely pitted, the pitting persistent in some individuals around the entire inner margin. Adductor scars rather small, crescentic, not deeply excavated, posterior and below the median horizontal. Pedal scar obscure.

Dimensions: Right valve, altitude, 10.6 millimeters; latitude, 6.1 millimeters, semi-diameter, 2.4 millimeters. Left valve of another individual; altitude, 10.5 millimeters; latitude, 6.95 millimeters; semi-diameter, 3.45 millimeters.

*Cotypes*.—U. S. Nat. Mus. Cat. No. 369239.

*Type locality*.—Austin-Elgin Ferry road, 1 mile north of Austin-Bastrop Highway, Bastrop County, Texas.

*Geologic horizon*.—Wilcox group, probably the Indio formation.

*Ostrea duvali* suggests in the sculpture characters *Ostrea crenulimarginata* Gabb and *Ostrea multilirata* Conrad. If the left valves alone were known, they would be referred without serious misgivings to *O. multilirata*; if the right valves only, they might be confused with *O. crenulimarginata* Gabb. The finer, more numerous radials of *O. duvali* serve to separate it from *O. crenulimarginata*, and the absence of radials upon the right valves distinguish it from *O. multilirata*.

The exact horizon of *Ostrea duvali* is not known but it is certainly Wilcox and younger than *Ostrea multilirata* Conrad.

I have the pleasure of dedicating this species to Mr. Hugh Duval of Bastrop, Texas, to whose kindness I am indebted for the knowledge of the locality. Many visiting geologists during the past few years have profited by Mr. Duval's keen observation, intelligent interest in the country about him, and his splendid collections—the best that I have seen in the way of a local assemblage.

*Occurrence*.—Austin-Elgin Ferry road, 1 mile north of Austin-Bastrop Highway, Bastrop County; Caldwell Knob, Bastrop County; 1 mile northeast of New Berlin, Guadalupe County.

Family PHOLADOMYACIDAE  
Genus PHOLADOMYA Sowerby

*Pholadomya* (*claibornensis* subsp.?) *harrisi* Gardner, n. sp.

1919. *Pholadomya claibornensis* Harris, Bull. Am. Pal. 6: 197. pl. 59, f. 9. Not *Pholadomya claibornensis* Aldrich, 1886.

Shell exceedingly thin, nacreous, oblong. Trigonal in outline, expanded anteriorly; the posterior dorsal margin approximately parallel to the base; the posterior extremity very broadly rounded. Umbones full, prominent, nearly terminal, the tips incurved and in contact. Concentric folds rather coarse, strong and regular, though incremental in character; radials well developed upon the medial portion of the shell, absent upon the extreme anterior and over a slightly greater posterior area; discontinuous, inclined to be nodose at the intersection with the concentric rugae and obsolete in the interspaces. Characters of the hinge and interior not known.

Dimensions: Altitude, 22.0 millimeters; latitude, 30.0 millimeters. (Taken from drawing.)

*Holotype*.—Cornell University, Ithaca, New York.

*Type locality*.—Two miles east of Alto, Cherokee County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

The Texas specimens have been separated from those from Alabama because of the stronger and more persistent radial sculpture and apparently coarser concentric markings. The species is poorly preserved, as a rule, and has only a meager representation so that it is difficult to determine either the constancy or the value of these differences.

I have the pleasure of naming the form in honor of Prof. Gilbert D. Harris of Cornell University.

Family VERTICORDIIDAE  
Genus VERTICORDIA (Searles Wood Ms.) Sowerby

*Verticordia satex* Gardner n. sp.

Figures 22, 23

Shell highly nacreous, small, compressed, subtrigonal in outline, inequilateral. Umbones sub-central, incurved, strongly prosogyrate. Margin directly in front of the umbones deeply excavated by the false lunule. Escutcheon absent. Anterior extremity strongly arcuate; posterior dorsal and lateral margins forming a parabolic curve from the umbones to the arcuate base. Outer surface heavily corded with 14 subequal, abruptly elevated ribs radiating from the umbones in gentle curves, convex posteriorly, more widely spaced medially but with no sharp break in the spacing; interradians deeply concave and wider than the radials; entire external surface micro-granular; outer margins sharply dentate. Ligament opisthodontic, deeply inset, continued to the apices of the umbones. A single, rather stout, subumbonal cardinal developed in the right valve, received in the left valve between the dorsal margin and the thickened inner margin of the lunule which functions as a denticle; posterior margin of right valve grooved to receive the bevelled margin of the left. Anterior muscle scar small, elongate, quite deeply sunken, its dorsal extremity beneath the ventral margin of the false lunule, posterior

muscle scar obscure. Pallial line remote from the margin, distinctly impressed.

Dimensions: Altitude, 3.0 millimeters; latitude, 3.0 millimeters; semi-diameter, 0.7 millimeter.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369240.

*Type locality*.—Mosley's Ferry, Brazos River, Brazos County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

*Verticordia satex* is doubtless related to *Verticordia eocenensis* Langdon described from Wautubbee Hills, Clarke County, Mississippi. The Texas species is a smaller and more delicate shell, less inflated, more trigonal in outline, with a more sharply elevated radial sculpture.

Family CRASSATELLITIDAE

Genus CRASSATELLITES Krüger

Subgenus CRASSINELLA Guppy

**Crassatellites (Crassinella) pteleina** Gardner n. sp.

Figures 18, 19

Shell very small, quite thin, nearly equilateral, evenly inflated, roughly a sector of 90°. Umbones inconspicuous, somewhat flattened upon their summits, the tips turned slightly forward. Lunule and escutcheon co-extensive with the dorsal margins, the lunule the narrower and the less produced; both of them sharply defined by the angulation of the valve and by the absence of any sculpture. Anterior dorsal margin shorter than the posterior; base arcuate. Surface smooth excepting for a somewhat exaggerated incremental sculpture, strongest upon the umbones and toward the lateral and ventral margins; an exceedingly fine radial lineation similar to that often discernible upon the recent *C. lunulatus* developed in some individuals. Ligament entirely internal; the ligament pit produced beneath the tips of the umbones. Hinge plate minute, the dentition delicate; right anterior cardinal partially fused with the dorsal margin; posterior cardinal short, slender, cuneate; anterior dorsal margin grooved its entire length to receive the bevelled edge of the left valve; posterior dorsal margin slightly modified to function as a lateral; dentition of left valve not known but doubtless normal. Adductor scars large but obscure. Pallial line simple, distant from the ventral margin.

Dimensions: Altitude, 2.5 millimeters; latitude, 2.75 millimeters; semi-diameter, 1.0 millimeter

*Holotype*.—Aldrich collection, Johns Hopkins University, Baltimore, Md.

*Type locality*.—Elm Creek, Lee County, Texas.

*Geologic horizon*.—Yegua formation (upper part of Claiborne group).

The species is remarkable for the even inflation of the disk, and the absence of any well-defined sculpture. Nothing very close to it has been recognized.

**Crassatellites (Crassinella) aldrichi** Gardner n. sp.

Figures 14–17

1919. *Crassinella minor* Harris (part), Bull. Am. Pal. 6: 92.

Not *Astarte minor* Lea, 1833.

Shell minute, compressed, narrow trigonal, nearly equilateral. Umbones

acute, feebly arcuate, the tips proximate, with a slight posterior inflection, nearly central in position. Dorsal margins straight, converging at an angle of not far from 90°; base line arcuate, a little more strongly upcurved anteriorly than posteriorly. Lunule and escutcheon co-extensive with the dorsal margins; escutcheon the wider of the two, and like the lunule defined not only by the angulation of the valves but also by the abrupt disappearance of the concentric sculpture. Sculpture very irregular in development, never very sharp; tips of umbones usually smooth; the rest of the shell concentrically wrinkled, the folds coarser, as a rule and less closely spaced upon the medial portion of the shell than upon the ventral, tending to flatten a little toward the margins of the lunule and the escutcheon where they abruptly disappear. Ligament entirely internal, the pit produced well beneath the umbones. Dentition delicate; anterior cardinal of right valve fused with the cardinal margin; posterior cardinal, laminar, somewhat cuneate; posterior dorsal margin bevelled to function as a lateral; anterior dorsal margin of right valve sulcate, the inner margin elevated medially; anterior cardinal of left valve elevated, laminar, the posterior cardinal very short and partially fused with the dorsal margin; margin of ligament pit elevated, simulating a tooth; anterior dorsal margin of left valve bevelled, the posterior sulcate, and the inner margin raised medially. Adductor scars relatively large. Pallial line simple. Inner margins not crenate.

Dimensions: Right valve: altitude, 2.6 millimeters; latitude, 2.5 millimeters, semi-diameter, 0.8 millimeter; left valve: altitude, 2.4 millimeters; latitude, 2.3 millimeters; semi-diameter, 0.7 millimeter.

*Cotypes*.—U. S. Nat. Mus. Cat. No. 369249.

*Type locality*.—4 miles southeast of Floresville, Wilson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

*Crassatellites* (*Crassinella*) *aldrichi* is the analogue in the Texas Eocene of *Crassatellites* (*Crassinella*) of Alabama. It is a smaller species than *C. parva* Lea with a more obtuse sculpture. The sculpture is not developed upon the umbones, as a rule, while in *C. minor* Lea the fine, sharp laminae are initiated at a very early stage.

*Crassatellites aldrichi* is restricted in its distribution and never very abundant. I have the honor to name it for Truman H. Aldrich, Esq., long among the foremost of the Tertiary paleontologists.

#### Family CARDITIDAE

#### Genus VENERICARDIA Lamarck

#### *Venericardia horatiana* Gardner, n. sp.

#### Figures 28, 29

Shell rather small, thin, rudely quadrate, moderately inflated; obscurely flattened posteriorly. Umbones quite small, incurved, prosogyrate, acutely tapering, placed a little in front of the median vertical. Lunule minute, deeply impressed. Anterior end very broadly rounded; posterior dorsal margin obliquely sloping, rounding into the vertically truncate lateral extremity; base line feebly arcuate. Tips of umbones reticulately sculptured; radials, excepting on weathered specimens, restricted to the dorsal posterior portion of the shell, most closely spaced posteriorly, not developed on the



extreme half or third of the shell; radials usually 20 or 21 in number, moderately elevated near the umbones and showing a slight tendency to be nodose; inter-radials near the umbones broadly U-shaped, the incrementals very fine and sharp and evenly developed in the channels but not over-riding the radials; radial sculpture away from the umbones sub-cutaneous; the inter-radials appearing as very feebly incised lines; least feeble posteriorly; a scalloped incremental sculpture showing faintly upon the ventral portion of the shell. Hinge plate moderately heavy. Ligament external, the area narrow and much produced. Dentition normal; anterior cardinal of right valve nearly obsolete; medial cardinal heavy, asymmetrically cuneate, posteriorly produced, feebly striated transversely; posterior right cardinal slender, elevated; anterior left cardinal short, stout; posterior cardinal much produced, relatively slender, the inner surface of the anterior and both the lateral surfaces of the posterior cardinal transversely striated. Characters of interior sharply defined by the slight thickening of the shell over the surface of the adherent mantle. Adductor scars very distinct, the anterior rudely reniform, the posterior semi-elliptical; pedal scar small but deeply impressed, directly dorsal to the anterior adductor. Pallial line simple, rather far removed from the ventral margin; inner margins strongly crenate.

Dimensions: Altitude, 25.0 millimeters; latitude, 27.0 millimeters; semi-diameter, 9.0 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369238.

*Type locality*.—1½ miles west of Sabinetown, Sabine County, Texas.

*Geologic horizon*.—Wilcox formation.

*Venericardia horatiana* is remarkable for the quadrate outline, and the character of the sculpture. Beneath the outer shell layer, the radials are angular and persistent to the ventral margin; but in perfectly preserved specimens, they are almost entirely concealed by the epidermal veil. This epidermis is produced, at the lower margin, a trifle beyond the layers beneath and the scalloping of this thin edge is remarkably sharp.

Though obviously of the general group of *V. planicosta*, this species is not approached very closely by any others.

*Venericardia trapaquara* subsp. *texalana* Gardner, n. subsp.

Figures 24–27

1919. *Venericardia trapaquara* Harris (part), Bull. Am. Pal. 6: 81. pl. 30, f. 7.

Shell of only moderate dimensions, rather thin, rudely trigonal to quadrate in outline, moderately inflated. Umbones gibbous, the tips incurved and prosogyrate, anterior in position. Lunule minute, depressed, sharply delimited. Anterior extremity strongly bowed in front of the lunule; posterior dorsal margin gently sloping, rounding broadly into the vertically truncate lateral margin; base line feebly arcuate. External surface sculptured with 20 to 22 obscurely terraced radials, each crowned with a narrow, sharply serrate cord; inter-radial channels broadly U-shaped, sharply delimited; microscopically sculptured by the down-curved incrementals. Ligament and dental characters normal. Adductor scars less conspicuous than in the heavier forms. Ventral and lateral margins strongly serrate.

Dimensions: Right valve: altitude, 17.0 millimeters: latitude, 16.0 milli-

meters; semi-diameter, 7.5 millimeters; left valve; altitude, 17.0 millimeters; latitude, 16.5 millimeters; semi-diameter, 6.65 millimeters.

*Holotype*.—Academy Natural Sciences, Philadelphia, Pa.

*Type locality*.—Black Shoals, Brazos River, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

This subspecies is remarkable for the relatively small number of ribs, and its sculpture is similar to that of *V. natchitoches* Harris, though the umbones are much lower. More perfect material may prove the subspecies to be deserving of specific rank.

Forms from St. Augustine, obviously of this same group, are more compressed and develop only 16 or 17 radials. Juveniles from the environs of Sabinetown are apparently referable to this subspecies though they are slightly more compressed than those from the type locality.

#### Subgenus PLEUROMERIS Conrad

#### *Venericardia* (*Pleuromeris*) *leonensis* Gardner, n. sp.

Figures 38, 39

Shell minute, solid, ovate-trigonal in outline, moderately inflated. Umbones broadly rounded, the tips proximate and nearly central; the smooth embryonic shell usually retained. Lunule relatively large, much depressed, sharply delimited. Dorsal margins converging at an angle of not far from 45°; anterior extremity bowed slightly in front of the lunule; posterior and ventral margins broadly rounded. External surface strongly fluted by the radials; radials 14 or 15 in number, as a rule, minutely nodose, increasingly elevated ventrally; inter-radials broadly U-shaped, microscopically striated by the incrementals, wider toward the ventral margin than the radials. Ligament external, opisthodontic, lodged in a narrow groove, about one-fourth as long as the posterior dorsal margin. Dentition rather delicate for so solid a shell; anterior right cardinal nearly obsolete; medial cardinal asymmetrically cuneate, much produced; posterior right cardinal obsolete; right posterior dorsal margin modified to function as a lateral; left anterior cardinal short, deltoid; left posterior cardinal relatively slender, produced parallel to the dorsal margin, separated from the cardinal by a deep trigonal sub-umbonal socket; a narrow pocket in the posterior dorsal margin to receive the modified dorsal margin of the right valve; anterior dorsal margin near the extremity of the lunule slightly modified and received in a corresponding groove in the right valve. Adductor scars relatively large. Pallial line simple. Inner margins coarsely crenate.

Dimensions: Altitude, 2.2 millimeters; latitude, 2.0 millimeters; semi-diameter, 1.0 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369247.

*Type locality*.—8 miles south of Jewett, Leon County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

*Venericardia leonensis* is smaller than *Venericardia parva* Lea and the ribs are less numerous. *V. parva symmetrica* Dall is quite similar in outline though more compressed. If I have read the description and figure of *V.*

*tortidens* Harris correctly, it is very close to *leonensis*, but thinner shelled and less trigonal in outline.

*Venericardia leonensis* is known only from the type locality.

Family CHAMIDAE

Genus PSEUDOCHAMA Odhner

*Pseudochama harrisi* Gardner, n. sp.

Figures 43, 44

1919. *Chama monroensis* Harris, Bull. Am. Pal. 6: 130. pl. 41, f. 2-4.  
Not *Chama monroensis* Aldrich, 1903.

Shell small, moderately heavy, rudely circular in outline; right valve evenly but not strongly inflated, the left attached valve much deeper. Umbones twisted forward, conspicuously so in the left valve; the nepionic characters not preserved. Lunule and escutcheon not defined. External surface of right valve sculptured with crowded lamellae, their free edges produced into spines, usually finer and longer upon the anterior portion of the shell; left valve not well preserved, apparently much more distantly sculptured. Ligament marginal, lodged in a deep groove produced to the tips of the umbones. Dentition rude; the prominent flattened subumbonal process in the left valve received between amorphous corrugated ridges in the right. Muscle scars large and prominent, the anterior elongated. Pallial line entire. Inner margins crenate.

Dimensions: Right valve: altitude, 14.5 millimeters; latitude, 16.5 millimeters; diameter, 6.0 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 139451.

*Type locality*.—8 miles west of Enterprise, Clarke Co., Mississippi.

*Geologic horizon*.—Lisbon formation (lower part of Claiborne group).

In sculptural characters, the species is much nearer to *P. mississippiensis* (Conrad) than it is to *P. monroensis* (Aldrich). The Vicksburg form, however, is more closely and strongly spinose than any of the lower Claiborne Eocene forms under observation.

I have the pleasure of naming the form in honor of Prof. Gilbert D. Harris of Cornell University, who was the first to indicate the peculiarities of this species.

Family LUCINIDAE

Genus PHACOIDES Blainville

Subgenus PARVILUCINA Dall

*Phacoides (Parvilucina) sabelli* Gardner, n. sp.

Figures 10-13

Shell small, solid, moderately inflated, inequilateral. Umbones small but well rounded, the tips acute and directed forward; prominent by reason of their elevation; nearly central in position. Lunule rather large, abruptly depressed, probably broader and more sharply defined in the left valve than in the right. Escutcheon exceedingly narrow. Dorsal margin excavated at the lunule; anterior lateral margin broadly rounded or even obtusely angulated; posterior dorsal margin obliquely sloping, the lateral margin vertically truncate; base line strongly arcuate, often obscurely angulated

posteriorly; posterior area flattened or even a little concave, defined by an obtuse keel running from the umbones to the posterior ventral margin; a shallow groove sometimes discernible near the margin. External surface smooth excepting for an incremental sculpture; and, in exceptional individuals, an exceedingly fine radial lineation. Ligament marginal, inset, the groove short, moderately deep, directed backward from the tips of the umbones. Dentition rather vigorous for so small a shell; anterior cardinal of right valve fused with the dorsal margin; posterior cardinal deltoid; anterior cardinal of left valve broader and more elevated than the posterior, separated from it by a trigonal pit for the reception of the right posterior cardinal; right laterals short, rather stout, conic, with a groove between them and the dorsal margins; receiving pockets of left valve correspondingly deep, their inner margins elevated. Adductor scars strongly impressed, the anterior reniform, the posterior irregular in outline. Pallial line entire; surface thickened and somewhat punctate over the area of the attached mantle. Inner margins crenate.

Dimensions: Right valve; altitude, 2.8 millimeters; latitude, 2.7 millimeters; diameter, 1.0 millimeter. Left valve: altitude, 2.5 millimeters; latitude, 2.5 millimeters; diameter, 1.0 millimeter.

*Cotypes*.—U. S. Nat. Mus. Cat. No. 369245.

*Type locality*.—1½ miles west of Sabinetown, Sabine County, Texas.

*Geologic horizon*.—Wilcox formation.

*Phacoides sabelli* is remarkable for the absence of any sculpture. It is restricted in its known distribution to the type locality.

Family DIPLODONTIDAE  
Genus DIPLODONTA Bronn

*Diplodonta satex* Gardner, n. sp.

Figures 34, 35

Shell small, rather compressed, rudely quadrate in outline. Umbones full but narrow, acute and feebly prosogyrate at their tips and overtopping the dorsal margins a little behind the median vertical. Anterior dorsal margin more produced than the posterior, the anterior extremity obtusely truncate vertically; the posterior, obliquely truncate; base line broadly arcuate. Lunule and escutcheon not developed. External surface smooth excepting for a quite sharp concentric grooving restricted in some individuals to the anterior portion of the shell, in others developed upon the posterior as well. Ligament marginal, opisthodic. Hinge apparently normal, though known only from the left valve; left anterior cardinal bifid, the posterior short and laminar, fused with the dorsal margin. Adductor scars and pallial line obscure. Inner margins beveled.

Dimensions: Altitude, 7.2 millimeters; latitude, 7.0 millimeters; semi-diameter, 2.5 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369234.

*Type locality*.—Three-fourths mile south of Elkhart, Anderson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

The angular outline is perhaps the most characteristic feature of this species. It is rather widely distributed in Anderson and Houston Counties but it has not been recognized elsewhere.

Family LEPTONIDAE  
Genus BORNIA Philippi

**Bornia zapataensis** Gardner, n. sp.

Figure 9

Shell small, thin, approximating a low isosceles triangle, slightly depressed medially; apical angle about  $110^\circ$ . Posterior dorsal margin slightly higher than the anterior; lateral margins quite sharply rounded, base line nearly straight. Lunule and escutcheon not defined. External surface radially grooved, the radii inclined away from the median vertical, leaving a small medial arc devoid of radial sculpture; radials sufficiently strong upon the anterior and posterior areas to flute the inner surface; a microscopically fine concentric striation developed over the entire disk. Interior filled with a hard matrix concealing the characters of the hinge and adductor and pallial scars.

Dimensions: Altitude, 5.0 millimeters; latitude, 6.5 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369237.

*Type locality*.—3 miles southeast of Zapata, Zapata County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

*Bornia zapataensis* is the analogue in the Cook Mountain in Texas of *Bornia isosceles* in the McBean formation in Georgia, and *Bornia scintillata* Dall in the Gosport sand. The sculpture of the Texas species approaches more closely to that of *B. scintillata* but it is neither so fine nor so sharp and covers a greater portion of the surface.

The type is unique.

Family TELLINIDAE  
Genus TELLINA Linnaeus

**Tellina makelloides** Gardner, n. sp.

Figures 41, 42

Shell very thin and fragile, about twice as broad as it is high; anterior portion much produced and evenly rounded; posterior end very short and obscurely rostrate. Umbones small, rising but little above the dorsal margin, strongly posterior, being only about half as far from the posterior extremity as they are from the anterior. Tips of umbones acute and inclined to be opisthogyrate. Posterior dorsal margin more steeply declining than the anterior; base line feebly arcuate; an inconspicuous but well defined fold, uniform in development from the umbones to the lower rostral angle. External surface smooth excepting for incrementals, strongest toward the ventral margin and, particularly, upon the rostral area. Ligament external, opisthodontic, the area linear, lanceolate, and extending for about half the length of the posterior dorsal margin. Hinge characters unknown. Adductor scars very obscure, as might be expected in so thin a shell. Rostral fold indicated on the casts by a rather sharp ridge. Pallial sinus not observed.

Dimensions: Altitude, 14.5 millimeters; latitude, 28.5 millimeters; diameter, 5.2 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369246.

*Type locality*.—Three-fourths mile south of Elkhart, Anderson County, Texas.

*Geologic horizon.*—Cook Mountain formation (lower part of Claiborne group).

The type is a partially calcified cast with portions of the shell still adhering. The maximum diameter is at some little distance in front of the beaks. *Tellina cynoglossula* of the Claiborne is similar in outline but is smaller and more strongly sculptured concentrically.

The species is restricted in its known distribution to the environs of the type locality.

Family CORBULIDAE

Genus CORBULA Bruguière

Subgenus CARYOCORBULA Gardner

*Corbula (Caryocorbula) engonatoides* Gardner, n. sp.

Figures 30, 31

Shell small, the right valve slightly larger than the left, notably compressed, rather solid, rudely rectangular in outline; rostrate posteriorly, the rostrum acutely angular, sharply pinched and slightly produced at the extremity; area between the rostrum and the raised margin of the escutcheon concave. Umbones low, somewhat anterior in position, flattened upon their summits, incurved and prosogyrate, the umbo of the right valve slightly in advance of that of the left. Lunule not differentiated. Escutcheon well defined both by the raised margin and the sharp change in the direction of the incrementals, wider in the right valve than in the left. Dorsal margins gently sloping; anterior extremity well rounded, the posterior extremity obliquely truncate between the keels; base line nearly horizontal, feebly constricted in front of the produced posterior keel. External sculpture absent or very feeble upon the dorsal portion of the shell, developed upon the medial and ventral portions in the form of very heavy concentric folds, often with a fine secondary concentric striation; concentric sculpture very strong on crossing the keel, continuing across it to the margin of the escutcheon, becoming laminar toward the ventral margin, and reduced to incrementals upon the escutcheon. Ventral margin of right valve incurved and overlapping the left. Ligament very short, inset, opisthodontic. Hinge normal; the single cardinal in the right valve moderately stout, conical, received in a correspondingly deep-subumbonal pit in the left valve; a dentate process developed behind the ligament support of the left valve but no true teeth. Interior more or less thickened in the adults. Muscle scars prominent. Pallial line distinct, obscurely truncate posteriorly but not sinuated.

Dimensions: Right valve: altitude, 5.3 millimeters; latitude, 8.5 millimeter; diameter, 2.4 millimeters; left valve: altitude, 4.5 millimeters; latitude, 7.5 millimeters; diameter, 2.5 millimeters.

*Cotypes.*—U. S. Nat. Mus. Cat. No. 369250.

*Type locality.*—Smithville, Bastrop County, Texas.

*Geologic horizon.*—Cook Mountain formation (lower part of the Claiborne group).

*Corbula engonatoides* is present in the lower part of the Claiborne group of Wautubbee, Mississippi, and has been confused with *C. engonata* Conrad, a Vicksburg species. The earlier form has a much more decided sculpture. The keel of *C. engonata* is distinct but it is not acute. In *C. engonatoides* it

is not only acute, but, toward the ventral margin, sharply pinched. Directly in front of the keel, in the adult, there is a slight constriction of the basal margin while the area behind it is decidedly concave. Neither the basal constriction nor the posterior depression have been observed in the Vicksburg form. The concentric sculpture, as a rule, is initiated later in *C. engonatoides* and is more pronounced. The very faint radial sculpture of the *C. barratiana* type which is usually discernible behind the keel of *C. engonata* has not been detected upon its progenitor.

***Corbula (Caryocorbula) augustae* Gardner, n. sp.**

Figures 32, 33

Shell small and very fragile, strongly inequivalve; the right valve much higher than the left and overlapping it ventrally and posteriorly. Right valve elevated trigonal in outline; the left, transversely ovate; right valve acutely rostrate posteriorly; a secondary keel developed at the margin of the escutcheon; the area between them depressed. Prodissoconch smooth and thick, capping the umbones as in *C. texana* Gabb. Umbones set a little in front of the median vertical, the right much more elevated than the left. Lunule not defined. Escutcheon smooth and rather narrow, produced the length of the dorsal margin. Anterior end well rounded from the umbones to the base; posterior extremity in right valve vertically truncate, acutely rounded in the left; base line arcuate. External surface of right valve concentrically furrowed from the prodissoconch to the ventral margin, the rugae overriding the keel and persisting to the margin of the escutcheon, though with diminished strength; concentric furrows upon left valve, coarser and fewer in number, weakening toward the anterior and posterior dorsal margins. Ligament short, inset; the support in the right valve relatively prominent. Right cardinal slender, a shallow groove near the ventral margin of the right valve for the reception of the edge of the left. Muscle scars not conspicuous. Pallial line entire, obscure.

Dimensions: Right valve: altitude, 6.0 millimeters; latitude, 7.0 millimeters; diameter, 3.0 millimeters. Left valve: altitude, 4.5 millimeters; latitude, 5.7 millimeters; diameter, 2.0 millimeters.

*Cotypes*.—U. S. Nat. Mus. Cat. No. 369242.

*Type locality*.—Augusta, Houston County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of Claiborne group).

The right valve strongly suggests a delicate *C. smithwillensis* Harris but the left valve with its coarse concentric sculpture is quite distinct from the high, inflated, feebly sculptured left valve of Harris's species.

Family RINGICULIDAE

Genus RINGICULA Deshayes

***Ringicula trapaquara* subsp. *deussenii* Gardner, n. subsp.**

Figure 40

Shell small, solid, rather squat; the aperture a little more than half the altitude of the entire shell. Whorls approximately five in number; those of the conch and protoconch not sharply differentiated; initial turn largely submerged, the succeeding volution becoming gradually higher and more inflated; beginning of conch probably indicated by the narrow posterior

tabulation introduced near the opening of the third whorl; whorls of spire trapezoidal in outline, the body broadly rounded. Surface sculptured with a relatively broad and deep sulcus near the posterior suture and nine or ten lineal sulci upon the body; area directly in front of the posterior sulcus smooth. Aperture oblique, constricted behind; peristome heavily calloused; outer lip slightly patulous, terminal varix wide and heavy, continuous with the parietal wash both anteriorly and posteriorly; serrate excepting along the margins of the siphonal exits. Columellar folds heavy, three in number; the posterior, posteriorly inclined, placed directly behind the abrupt constriction of the body, the medial nearly horizontal and very close to the marginal anterior plait; both the incurrent and excurrent siphonal notches rather broad and deep.

Dimensions: Altitude, 2.5 millimeters; maximum diameter, 1.6 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369236.

*Type locality*.—4 miles southeast of Floresville, Wilson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

The subspecies *deusseni* differs from *Ringicula trapaquara*, strict sense, in the absence of spiral sculpture over the posterior portion of the body. The sulci are often not developed, at least upon the early whorls of the spire, in *R. trapaquara* s.s. but in the subspecies this character persists to the adult stage. The subspecies has been confused with *Ringicula buplicata* Lea, a similarly sculptured form but more slender and decidedly less calloused about the aperture.

Family LIMNAEIDAE  
Genus PLANORBIS Müller

*Planorbis andersoni* Gardner, n. sp.

Figures 36, 37

Shell small, exceedingly thin, discoidal, depressed on the umbilical, and to a lesser degree, on the apical surface. Whorls five in number, the two earliest included in the protoconch; first whorl of conch constricted at its opening and depressed below the plane of the protoconch; later whorls increasing rather rapidly in diameter and altitude; body relatively high, broadly rounded along the periphery; obtusely rostrate on both the apical and umbilical surfaces. Surface sculpture not developed. Aperture reniform, adnate to the body wall upon the inner surface; less produced and more sharply rounded anteriorly than posteriorly. Umbilical surface funnel-shaped and somewhat scalariform, revealing all of the obtusely carinated posterior extremities of the component whorls.

Dimensions: Altitude, 1.0 millimeter; maximum latitude, 2.2 millimeters; latitude, at right angles to maximum latitude, 2.0 millimeters.

*Holotype*.—U. S. Nat. Mus. Cat. No. 369235.

*Type locality*.—Three-fourths of a mile south of Elkhart, Anderson County, Texas.

*Geologic horizon*.—Cook Mountain formation (lower part of the Claiborne group).

This fresh-water genus has not been previously reported from the Eocene of Texas. It is fairly common at the single locality at which it is represented.



## ILLUSTRATIONS

Figures 1-4. *Ostrea dwali* Gardner, n. sp. (p. 366).

1. Interior of left valve (cotype); altitude, 10.5 millimeters; latitude, 6.95 millimeters.
2. Interior of right valve (cotype); altitude 10.6 millimeters; latitude, 6.1 millimeters.
3. Exterior of right valve (cotype); altitude, 10.6 millimeters; latitude, 6.1 millimeters.
4. Exterior of left valve (cotype); altitude, 10.5 millimeters; latitude, 6.95 millimeters.

Figure 5. *Leda trivitate* Gardner, n. sp. (p. 363).

- Dorsal view of double valves (type); latitude, 4.0 millimeters; diameter, 2.1 millimeters.

Figure 6. *Leda jewetti* Gardner, n. sp. (p. 363).

- Exterior of right valve; altitude, 3.8 millimeters; latitude, 6.2 millimeters.

Figures 7, 8. *Leda atakta* Gardner, n. sp. (p. 364).

7. Exterior of left valve (type); altitude, 3.5 millimeters; latitude, 6.0 millimeters.
8. Dorsal view of double valves (type); diameter, 2.6 millimeters.

Figure 9. *Bornia zapataensis* Gardner, n. sp. (p. 374).

- Exterior of right valve (type); altitude, 5.0 millimeters; latitude, 6.5 millimeters.

Figures 10-13. *Phacoides (Parvilucina) sabelli* Gardner, n. sp. (p. 372).

10. Interior of left valve (cotype); altitude, 2.5 millimeters; latitude, 2.5 millimeters.
11. Exterior of right valve (cotype); altitude, 2.8 millimeters; latitude, 2.7 millimeters.
12. Interior of right valve (cotype); altitude, 2.8 millimeters; latitude, 2.7 millimeters.
13. Exterior of left valve (cotype); altitude, 2.5 millimeters; latitude, 2.5 millimeters.

Figures 14-17. *Crassatellites (Crassinella) aldrichi* Gardner, n. sp. (p. 368).

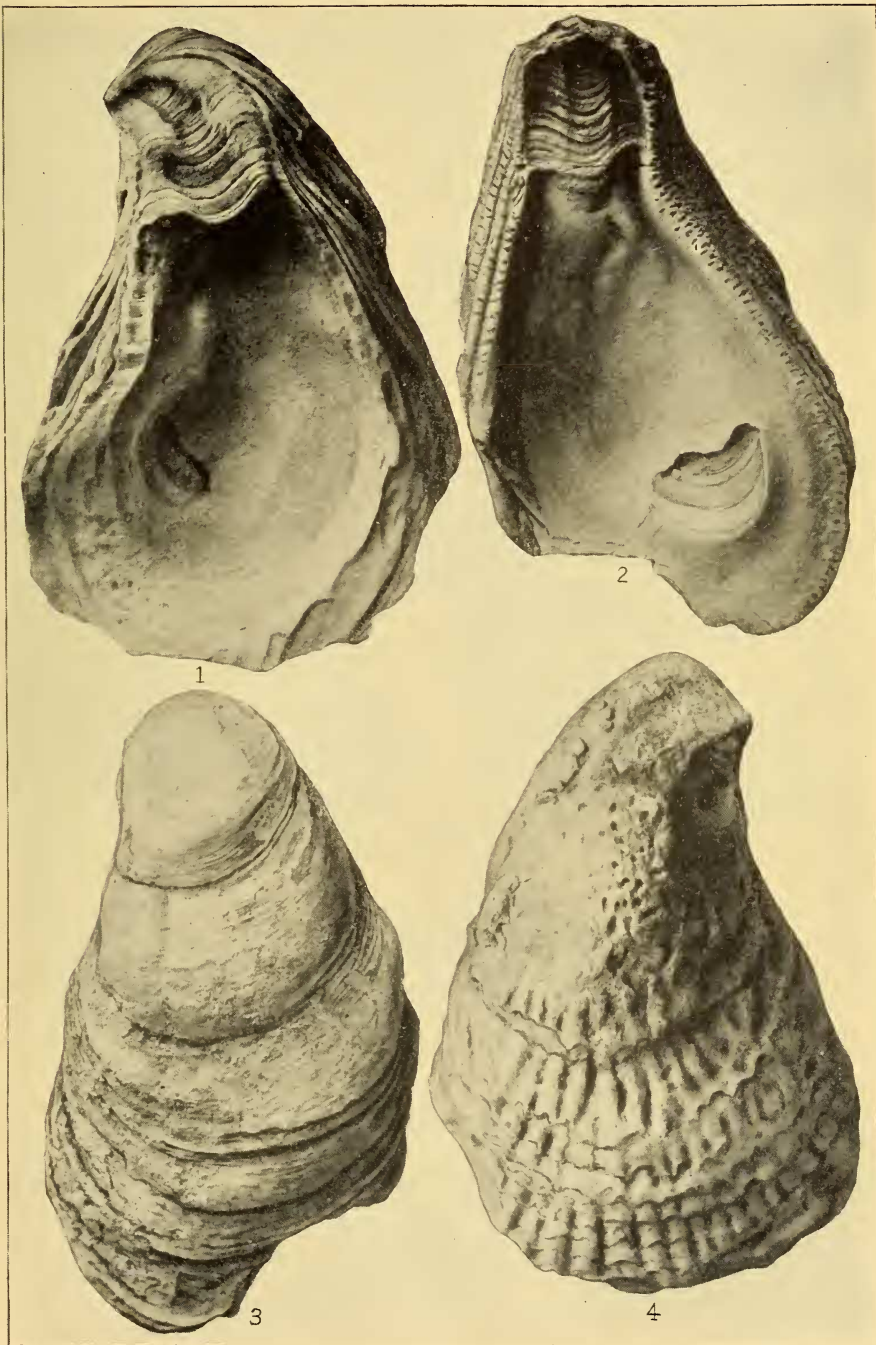
14. Interior of right valve (cotype); altitude, 2.6 millimeters; latitude, 2.5 millimeters.
15. Exterior of right valve (cotype); altitude, 2.6 millimeters; latitude, 2.5 millimeters.
16. Interior of left valve (cotype); altitude, 2.4 millimeters; latitude, 2.3 millimeters.
17. Exterior of left valve (cotype); altitude, 2.4 millimeters; latitude, 2.3 millimeters.

Figures 18,19. *Crassatellites (Crassinella) pteleina* Gardner, n. sp. (p. 368).

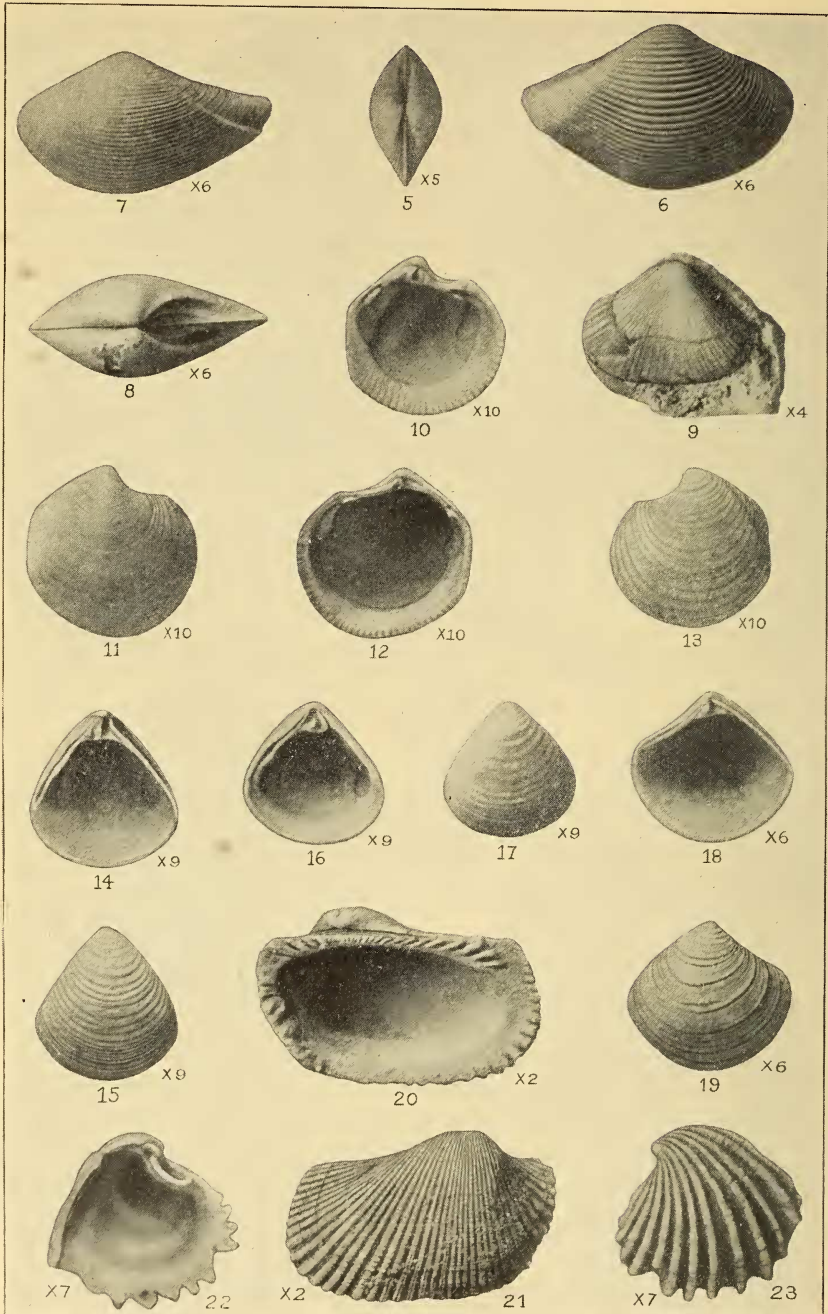
18. Interior of right valve (type); altitude, 2.5 millimeters; latitude, 2.75 millimeters.
19. Exterior of right valve (type); altitude, 2.5 millimeters; latitude, 2.75 millimeters.

Figures 20, 21. *Barbatia deussenii* Gardner, n. sp. (p. 365).

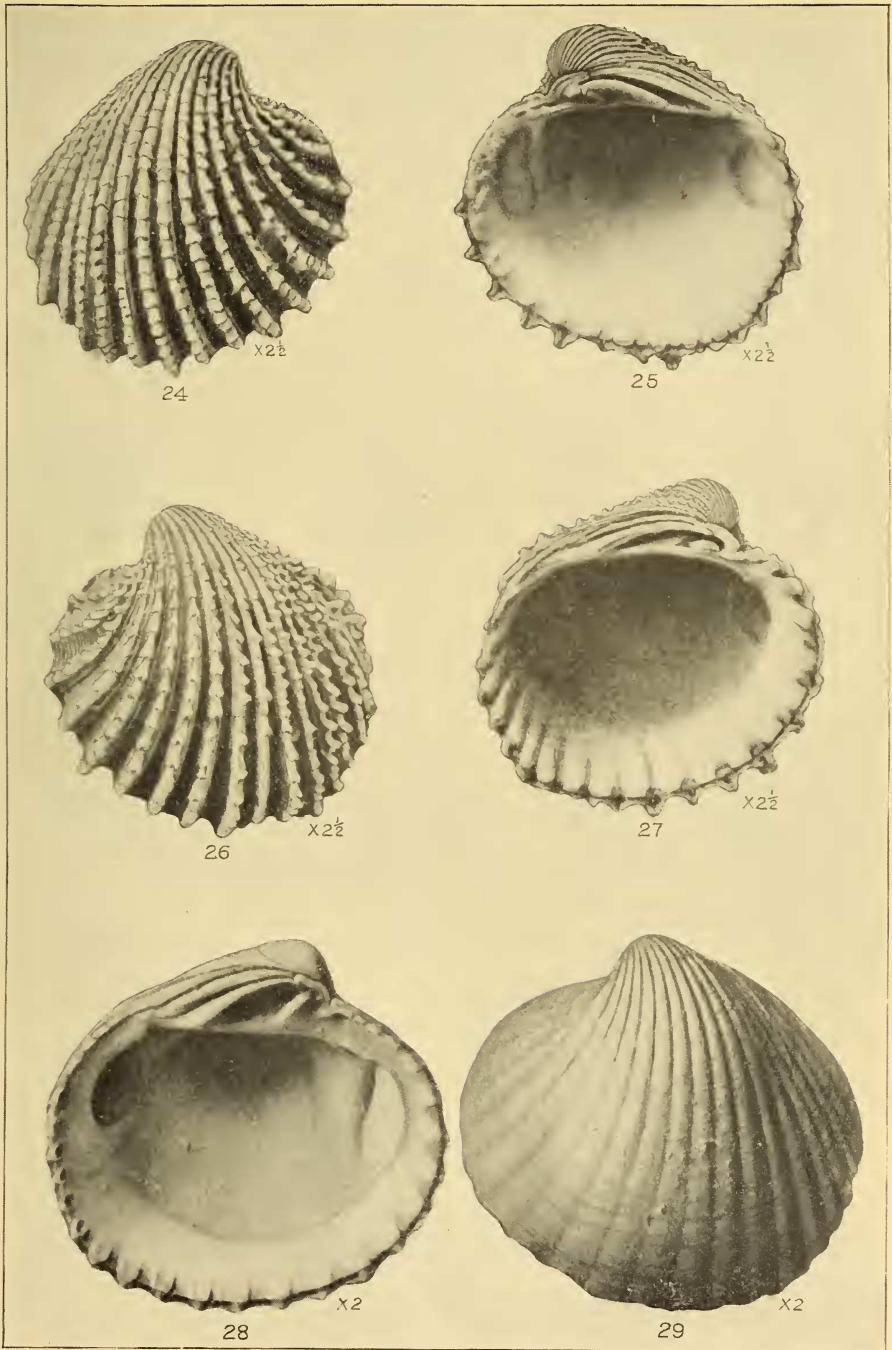
20. Interior of right valve (type); altitude, 11.6 millimeters; latitude, 17.7 millimeters.
21. Exterior of right valve (type); altitude, 11.6 millimeters; latitude, 17.7 millimeters.



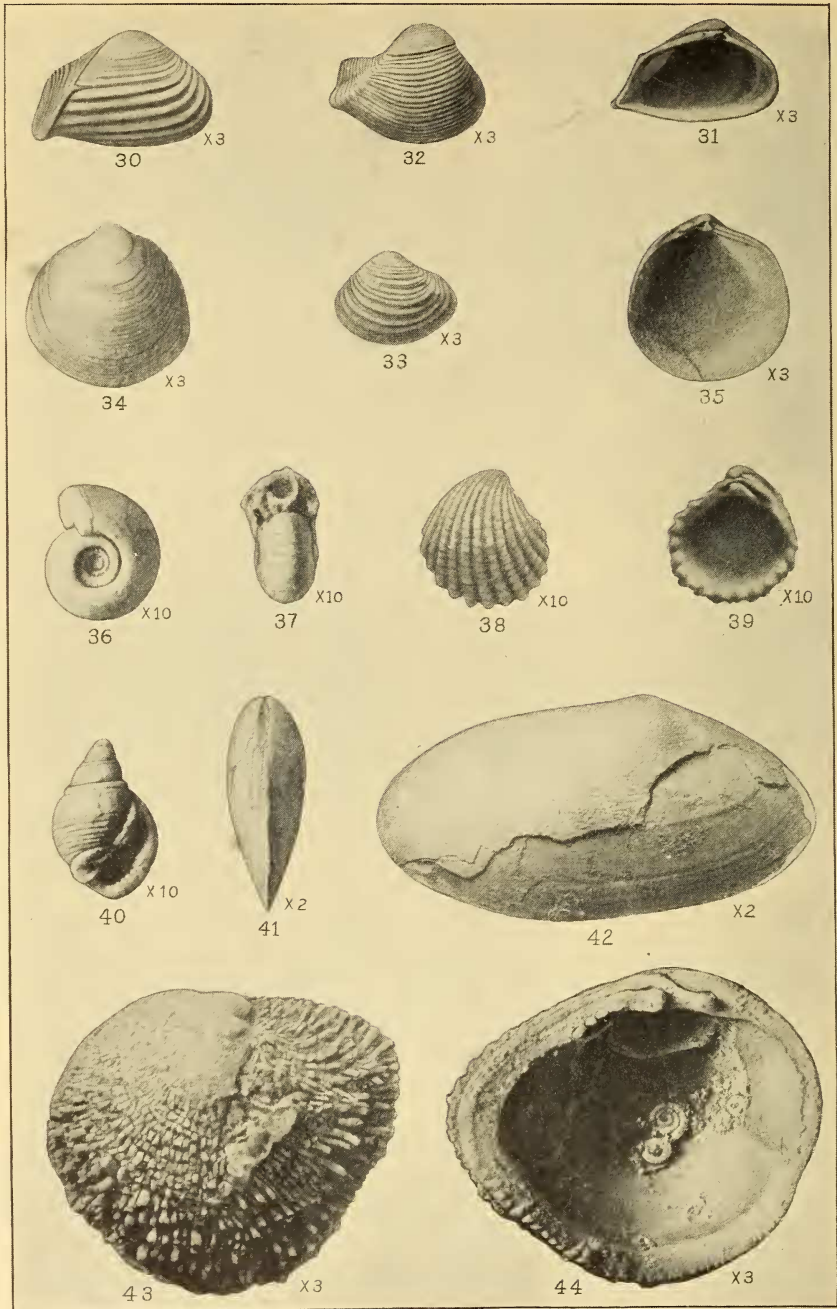
Figures 1-4, *Ostrea duwali*



Figures 5-23. 5, *Leda trivitate*; 6, *L. jewetti*; 7, 8, *L. atakta*; 9, *Bornia zapataensis*; 10-13, *Phacoides (Parvilucina) sabelli*; 14-17, *Crassatellites (Crassinella) aldrichi*; 18, 19, *C. pleleina*; 20, 21, *Barbatia deusseni*; 22, 23, *Verticordia satex*.



Figures 24-29. 24-27, *Venericardia trapaquara* subsp. *texalana*; 28, 29, *V. horatiana*.



Figures 30-44. 30, 31, *Corbula (Caryocorbula) engonatooides*; 32, 33, *C. augustae*; 34, 35, *Diplodonta satez*; 36, 37, *Planorbis andersoni*; 38, 39, *Venericardia (Pleuromeris) leonensis*; 40, *Ringicula trapaquara* subsp. *deussenii*; 41, 42, *Tellina makelloides*; 43, 44, *Pseudochama harrisi*.

Figures 22, 23. *Verticordia satez* Gardner, n. sp. (p. 367).

22. Interior of left valve (type); altitude, 3.0 millimeters; latitude, 3.0 millimeters.

23. Exterior of left valve (type); altitude, 3.0 millimeters; latitude, 3.0 millimeters.

Figures 24-27. *Venericardia trapaquara* subsp. *texalana* Gardner, n. subsp. (p. 370).

24. Exterior of right valve (cotype); altitude, 17.0 millimeters; latitude, 16.0 millimeters.

25. Interior of right valve (cotype); altitude, 17.0 millimeters; latitude, 16.0 millimeters.

26. Exterior of left valve (cotype); altitude, 17.0 millimeters; latitude, 16.5 millimeters.

27. Interior of left valve (cotype); altitude, 17.0 millimeters; latitude, 16.5 millimeters.

Figures 28, 29. *Venericardia horatiana* Gardner, n. sp. (p. 369).

28. Interior of left valve (type); altitude, 25.0 millimeters; latitude, 27.0 millimeters.

29. Exterior of left valve (type); altitude, 25.0 millimeters; latitude, 27.0 millimeters.

Figures 30, 31. *Corbula (Caryocorbula) engonatooides* Gardner, n. sp. (p. 375).

30. Exterior of right valve (cotype); altitude, 5.3 millimeters; latitude, 8.5 millimeters.

31. Interior of left valve (cotype); altitude, 4.5 millimeters; latitude, 7.5 millimeters.

Figures 32, 33. *Corbula (Caryocorbula) augustae* Gardner, n. sp. (p. 376).

32. Exterior of right valve (cotype); altitude, 6.0 millimeters; latitude, 7.0 millimeters.

33. Exterior of left valve (cotype); altitude, 4.5 millimeters; latitude, 5.7 millimeters.

Figures 34, 35. *Diplodonta satez* Gardner, n. sp. (p. 373).

34. Exterior of left valve (type); altitude, 7.2 millimeters; latitude, 7.0 millimeters.

35. Interior of left valve (type); altitude, 7.2 millimeters; latitude, 7.0 millimeters.

Figures 36, 37. *Planorbis andersoni* Gardner, n. sp. (p. 377).

36. Umbilical view (type); maximum diameter, 2.2 millimeters; diameter at right angles to maximum diameter, 2.0 millimeters.

37. Apertural view (type); altitude, 1.0 millimeter.

Figures 38, 39. *Venericardia (Pleuromeris) leonensis* Gardner, n. sp. (p. 371).

38. Exterior of right valve (type); altitude, 2.2 millimeters; latitude, 2.0 millimeters.

39. Interior of right valve (type); altitude, 2.2 millimeters; latitude, 2.0 millimeters.

Figure 40. *Ringicula trapaquara* subsp. *deussenii* Gardner, n. subsp. (p. 376).

Apertural view (type); altitude, 2.5 millimeters; diameter, 1.6 millimeters.

Figures 41, 42. *Tellina makelloides* Gardner, n. sp. (p. 374).

41. Posterior view of double valves (type); diameter, 5.2 millimeters.

42. Exterior of left valve (type); altitude, 14.5 millimeters; latitude, 28.5 millimeters.

Figures 43, 44. *Pseudochama harrisi* Gardner, n. sp. (p. 372).

43. Exterior of right valve (type); altitude, 14.5 millimeters; latitude, 16.5 millimeters.

44. Interior of right valve (type); altitude, 14.5 millimeters; latitude, 16.5 millimeters.